

## Technical Memorandum

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### ***Significant Nutrient and Biochemical Oxygen Demand Point Sources and Nonpoint Sources in the Newport Bay System***

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EPA requires that Total Maximum Daily Load (TMDL) allocations account for all significant sources of each impairing pollutant. This technical memorandum identifies, in detail, the significant surface water discharges and significant nonpoint sources of nitrogen (TN) the Newport Bay System and their distribution between different sub-basins of the system. It also identifies in detail how Biochemical Oxygen Demand (BOD) load in the Kitts Branch is distributed among various point sources to meet water quality standards. Modeling input information is provided for simulating all potentially significant point sources as discrete discharges. These are conceptual values that are within the TMDL thresholds. They represent viable individual allocations to each point source. However, the Maryland Department of the Environment (MDE) expressly reserves the right to allocate the loads among different sources in any manner that is reasonably calculated to achieve water quality standards.

TMDLs are being established in the Newport Bay System watersheds for three different flow regime conditions: summer flow, spring flow and winter flow. The nonpoint source loads that were used in the model account for both “natural” and human-induced components. Summer-flow nonpoint source loads were based on in-stream monitoring data.

The average annual nonpoint source loads were determined using land use loading coefficients. The land use information was based on 1997 Maryland Department of Planning data. The total nonpoint source load was calculated by summing all of the individual land use areas and multiplying by the corresponding land use loading coefficients. The baseline loading coefficients were based on a study conducted in the Maryland Coastal Bays (University of Maryland, 1993<sup>1</sup>), with appropriate inclusion of urban loadings from the town of Berlin, groundwater loadings, and the atmospheric deposition to the open water surface. The groundwater load was calculated based on the recent study conducted by USGS. The atmospheric deposition load was calculated by multiplying the surface area of each water quality model segment by a loading coefficient. The atmospheric loading coefficient was based on the atmospheric deposition monitoring station MD18, Assateague Island National Seashore-Woodcock established by National Atmospheric Deposition Program..

Table 1A provides point source modeling information for summer-flow TMDLs for TN for the entire Newport Bay System. Table 1B provides the point source modeling information for BOD for the Kitts Branch. This is supplemented by Table 1C, which provides additional information attributed to each point source for the summer-flow TMDL calculations.

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<sup>1</sup> University of Maryland Center for Environmental and Estuarine Studies, “Maryland’s Coastal Bays: An Assessment of Aquatic Ecosystems, Pollutant Loadings, and Management Options,” 1993.

**Table 1A**  
**Loads Attributed to Significant Point Sources for**  
**the Summer Flow Nitrogen TMDL<sup>a</sup> in the Newport Bay System**

| Source Name             | Permit Number | TN Load<br>(lbs/month) | Flow<br>(mgd) | Concentration<br>(mg/l) |
|-------------------------|---------------|------------------------|---------------|-------------------------|
| Kelly Foods Corporation | MD0001309     | 75                     | 0.02          | 15                      |
| Tyson Food Inc.         | MD0002071     | 802                    | 0.8           | 4                       |

**Table 1B**  
**Loads Attributed to Significant Point Sources for**  
**the Summer Flow BOD TMDL<sup>a</sup> in the Kitts Branch**

| Source Name             | Permit Number | BOD Load<br>(lbs/month) | Flow<br>(mgd) | Concentration<br>(mg/l) |
|-------------------------|---------------|-------------------------|---------------|-------------------------|
| Kelly Foods Corporation | MD0001309     | 100                     | 0.02          | 20                      |
| Tyson Food Inc.         | MD0002071     | 1200                    | 0.8           | 6                       |

**Table 1C**  
**Additional Assumptions for Low Flow TMDLs<sup>a,b</sup>**

|                        |                        | Kelly Foods | Tyson Foods |
|------------------------|------------------------|-------------|-------------|
| <b>BOD</b>             | <i>kg/d</i>            | 1.514       | 18.144      |
| <b>DO</b>              | <i>kg/d</i>            | 0.112       | 21.017      |
| <b>NH<sub>3</sub></b>  | <i>kg/d</i>            | 0.104       | 3.026       |
| <b>ON</b>              | <i>kg/d</i>            | 0.120       | 0.194       |
| <b>NO<sub>2</sub>3</b> | <i>kg/d</i>            | 0.112       | 8.931       |
| <b>PO<sub>4</sub></b>  | <i>kg/d</i>            | 0.007       | 0.735       |
| <b>OP</b>              | <i>kg/d</i>            | 0.007       | 0.779       |
| <b>Flow</b>            | <i>m<sup>3</sup>/s</i> | 0.0003      | 0.0351      |
| <b>Total Nitrogen</b>  | <i>kg/d</i>            |             | 12.5        |

Table 2A provides point source modeling information for spring-flow TMDLs for TN for the entire Newport Bay System. Table 2B provides the point source modeling information for BOD for the Kitts Branch. This is supplemented by Table 2C, which provides additional information attributed to each point source for the spring-flow TMDL calculations.

<sup>a</sup> These loadings correspond to Model Scenario 4 in the Draft TMDL *Total Maximum Daily Loads of Nitrogen for Three Tidal Tributaries and Total Maximum Daily Load of Biochemical Oxygen Demand for One Tributary in the Newport Bay System, Worcester County, Maryland*, December, 2002.

<sup>b</sup> 1 Kg = 2.2 lbs

**Table 2A**  
**Loads Attributed to Significant Point Sources for**  
**the Spring Flow Nitrogen TMDLs<sup>c</sup> in the Newport Bay System**

| Source Name             | Permit Number | TN Load<br>(lbs/month) | Flow<br>(mgd) | Concentration<br>(mg/l) |
|-------------------------|---------------|------------------------|---------------|-------------------------|
| Kelly Foods Corporation | MD0001309     | 22                     | 0.006         | 15                      |
| Tyson Food Inc.         | MD0002071     | 1604                   | 0.8           | 8                       |

**Table 2B**  
**Loads Attributed to Significant Point Sources for**  
**the Spring Flow BOD TMDLs<sup>c</sup> in the Kitts Branch**

| Source Name             | Permit Number | BOD Load<br>(lbs/month) | Flow<br>(mgd) | Concentration<br>(mg/l) |
|-------------------------|---------------|-------------------------|---------------|-------------------------|
| Kelly Foods Corporation | MD0001309     | 30                      | 0.006         | 20                      |
| Tyson Food Inc.         | MD0002071     | 4500                    | 0.8           | 22                      |

**Table 2C**  
**Additional Assumptions for the Spring-Flow TMDL<sup>b, c</sup>**

|                       |                        | Kelly Foods | Tyson Foods |
|-----------------------|------------------------|-------------|-------------|
| <b>BOD</b>            | <i>kg/d</i>            | 0.447       | 68.039      |
| <b>DO</b>             | <i>kg/d</i>            | 0.112       | 18.170      |
| <b>NH<sub>3</sub></b> | <i>kg/d</i>            | 0.104       | 3.026       |
| <b>ON</b>             | <i>kg/d</i>            | 0.120       | 3.392       |
| <b>NO<sub>2</sub></b> | <i>kg/d</i>            | 0.112       | 17.799      |
| <b>PO<sub>4</sub></b> | <i>kg/d</i>            | 0.007       | 2.942       |
| <b>OP</b>             | <i>kg/d</i>            | 0.007       | 3.115       |
| <b>Flow</b>           | <i>m<sup>3</sup>/s</i> | 0.0003      | 0.0351      |
| <b>Total Nitrogen</b> | <i>kg/d</i>            |             | 24.6        |

Table 3A provides point source modeling information for winter-flow TMDLs for TN for the entire Newport Bay System. This is supplemented by Table 3B, which provides additional information attributed to each point source for the winter-flow TMDL calculations.

<sup>b</sup> 1 Kg = 2.2 lbs

<sup>c</sup> These loadings correspond to Model Scenario 5 in the Draft TMDL *Total Maximum Daily Loads of Nitrogen for Three Tidal Tributaries and Total Maximum Daily Load of Biochemical Oxygen Demand for One Tributary in the Newport Bay System, Worcester County, Maryland*, December 2002.

**Table 3A**  
**Loads Attributed to Significant Point Sources for**  
**the Winter Flow Nitrogen TMDLs<sup>d</sup> in the Newport Bay System**

| Source Name             | Permit Number | TN Load<br>(lbs/month) | Flow<br>(mgd) | Concentration<br>(mg/l) |
|-------------------------|---------------|------------------------|---------------|-------------------------|
| Berlin WWTP             | MD0022632     | 6009                   | 1.0           | 24                      |
| Kelly Foods Corporation | MD0001309     | 22                     | 0.006         | 15                      |
| Tyson Food Inc.         | MD0002071     | 3622                   | 0.8           | 18                      |

**Table 3B**  
**Additional Assumptions for the Winter-Flow TMDL<sup>b, d</sup>**

|                        |                        | Berlin WWTP | Kelly Foods | Tyson Foods |
|------------------------|------------------------|-------------|-------------|-------------|
| <b>BOD</b>             | <i>kg/d</i>            | 113.562     | 0.447       | 68.039      |
| <b>DO</b>              | <i>kg/d</i>            | 18.927      | 0.112       | 18.170      |
| <b>NH<sub>3</sub></b>  | <i>kg/d</i>            | 35.431      | 0.104       | 12.105      |
| <b>ON</b>              | <i>kg/d</i>            | 45.425      | 0.120       | 2.409       |
| <b>NO<sub>2</sub>3</b> | <i>kg/d</i>            | 9.993       | 0.112       | 40.253      |
| <b>PO<sub>4</sub></b>  | <i>kg/d</i>            | 1.559       | 0.007       | 2.942       |
| <b>OP</b>              | <i>kg/d</i>            | 0.334       | 0.007       | 3.115       |
| <b>Flow</b>            | <i>m<sup>3</sup>/s</i> | 0.0438      | 0.0003      | 0.0351      |
| <b>Total Nitrogen</b>  | <i>kg/d</i>            |             |             | 146.0       |

The loadings, concentrations, and flows represented in the tables above are for illustrative purposes only. Actual effluent limits and related permit conditions will be established at the time of permit issuance or renewal and will be based upon conditions present at that time, as reflected in population projections, infrastructure needs as defined in County Comprehensive Water and Sewer Plans, and appropriate concentrations and loadings needed to address impairments of the water quality limited segments identified by this TMDL and the applicable 303(d) list. The total loads from all sources will, however, remain the same as the subtotals and grand totals reflected in the tables. Point source loadings, flows, and concentrations placed in permits will be based upon the information listed above as well as that provided during the permit adjudication process.

Table 4A and Table 4B provide one possible scenario for the distribution of spring flow and winter flow nitrogen nonpoint source loads between different sub-basins of the Northern Coastal Bays system respectively.

<sup>d</sup> These loadings correspond to Model Scenario 6 in the Draft TMDL *Total Maximum Daily Loads of Nitrogen for Three Tidal Tributaries and Total maximum Daily Load of Biochemical Oxygen Demand for One Tributary in the Newport Bay System, Worcester County, Maryland*, December 2002.

<sup>b</sup> 1 Kg = 2.2 lbs

**Table 4A**  
**Nonpoint Source Nitrogen Loads**  
**Attributed to Significant Sub-Basins for Spring Flow TMDLs**

| <b>Sub-basins of<br/>Newport Bay System</b> | <b>Nonpoint Sources (TN)<br/>Load (lbs/month)</b> |
|---|---|
| Ayer Creek                                  | 1,824   |
| Newport Creek                               | 2,084   |
| Newport Bay                                 | 14,817 <sup>2</sup>                               |

**Table 4B**  
**Nonpoint Source Nitrogen Loads**  
**Attributed to Significant Sub-Basins for Winter Flow TMDLs**

| <b>Sub-basins of<br/>Newport Bay System</b> | <b>Nonpoint Sources (TN)<br/>Load (lbs/month)</b> |
|---|---|
| Ayer Creek                                  | 2,085   |
| Newport Creek                               | 2,741   |
| Newport Bay                                 | 21,506 <sup>2</sup>                               |

- 1 The baseline NPS load is based on land use loading rates, described above, applied to 1997 land use estimates. It also includes direct atmospheric deposition to surface water and direct groundwater discharge.
- 2 This includes loads from Ayer Creek and the Newport Creek, accounting for transport losses as the loads pass through the tributaries to the Newport Bay. Includes about 400lbs attributed to Newark WWTP, which is addressed as upstream background for this analysis. Newark will be addressed explicitly as part of a future analysis of Marshall Creek.

It must be noted that these loads are based on broad-scaled estimates. Efforts will be undertaken in the future to obtain better estimates of the land uses and loading rates.